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(19) (CA) **CANADIAN PATENT** (12)

(54) BATTERY HOLDER

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ABSTRACT

Battery holder.

A battery holder which is pivotable, about a  
pivot arranged in an apparatus housing, from an operating  
position to a battery replacement position, at least one  
battery being clamped between electrical contacts in the  
5 , operating position, whilst the battery is not subject to  
clamping between the electrical contacts in the replace-  
ment position. During the pivoting of the holder from the  
replacement position towards the operating position, the  
contact force exerted on the battery by the electrical  
10 contacts is gradually built up.

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The invention relates to a battery holder with a battery which is clamped between a first electrical contact and a second electrical contact in the operating position and which is at least partly enclosed by wall portions of the holder, said holder being pivotable, about a first pivot provided in the apparatus housing, from the operating position to a battery replacement position, the battery being subject to a substantially centrically directed end contact force in the operating position, whilst the battery is not subject to clamping between said electrical contacts in the replacement position.

In a known holder of the described kind (our French Patent Specification No. 1,208,847 which issued on February 25, 1960), the two electrical contacts wherebetween a battery in the holder is to be clamped consist of two metal leaf springs. These leaf springs are rigidly arranged in the apparatus housing. After the holder has been provided with a new battery in the battery replacement position, the holder is pivoted into the apparatus housing again. As soon as the contact face of the battery contacts the contact side of the leaf springs arranged in the apparatus housing, the total contact force (end contact force or clamping force) is present substantially immediately, so that further pivoting of the holder into the operating position must be realised against the frictional force caused by the total contact



force on the contact face of the battery. The immediate presence of the total contact force is not only liable to give the user the impression that the holder is jammed, but is also undesirable because the risk of tilting of the battery in the holder is increased by the initially eccentrically acting total force. Particularly when a plurality of batteries are coaxially arranged in the holder, one in the prolongation of the other, the said risk of tilting of one or more of the batteries is very real.

The invention has for its object to provide a battery holder accommodating a battery (batteries) which is (are) readily accessible in the replacement position and in which the contact force of the battery (batteries) is minimized during the pivoting of the battery (batteries) to the operating position, this contact force reaching its maximum value only at the instant at which the contact force acts substantially centrically on the battery (batteries).

To this end, a holder in accordance with the invention is characterized in that the holder is provided with a panel which is pivotable about a second pivot with respect to the holder and on which the first electrical contact is provided, one side of said panel being in pressure contact, during the movement of the holder from the replacement position to the operating position, with a wall portion of the apparatus housing, its other side being in contact, via the moving first electrical contact, with the battery at a contact force which gradually increases until it equals the end contact force due to the pivoting movement of the panel.

The invention will be described in detail hereinafter with reference to the drawing which shows a preferred embodiment of a battery holder in accordance with the invention in the battery replacement position.

A battery holder as shown in the drawing is made of a synthetic material, for example, polystyrene, and comprises a moulded plain bearing 3 which is pivotable about a rigidly arranged pivot 5. The pivot 5 is made to

be integral with the wall of an apparatus housing 7 of polystyrene which serves, for example, to accommodate a radio (or radio recorder combination) which is powered by means of batteries 9, 11, 13, 15, 17 and 19, and which is not shown in the drawing for the sake of clarity. The battery holder 1 comprises an elongate, mainly rectangular bilaterally open container comprising a bottom 21 and two mutually parallel longitudinal walls 23 and 25 which extend perpendicularly to the flat outer surface of the bottom 21. The end of the longitudinal wall 25 which is remote from the pivot 5 is provided with a moulded-on pivot 27 whereabout a plain bearing 29 can rotate. The pivots 5 and 27 are parallel to each other and extend perpendicularly to the outer surface of the bottom 21. The plain bearing 29 is made to be integral with a pivotable panel 31 of, for example, polystyrene, which extends perpendicularly to the outer surface of the bottom 21. The inner side of the bottom 21 is provided with a profile in the form of two parallel troughs 33 and 35 whose shape corresponds to the cylindrical shape of the batteries 9, 11, 13, 15, 17 and 19. The trough 33 accommodates the batteries 9, 11 and 13 which are coaxially arranged one in the prolongation of the other, whilst the trough 35 accommodates the batteries 15, 17 and 19 which are also coaxially arranged one in the prolongation of the other. The row of batteries 9, 11 and 13 is parallel to the row of batteries 15, 17 and 19. The battery housing 7 comprises two rectangular spaces 39 and 41 which are separated by a partition 37. The spaces 39 and 41 are bounded on their lower side by a common lower wall 43, and on their upper side by a common upper wall 45 which is parallel to the lower wall 43. A rear wall 40 which is common to the spaces 39 and 41 extends perpendicularly to the walls 43 and 45. The space 39 is bounded on one side by the partition 37 which extends perpendicularly to the walls 43 and 45, and on its other side by the sidewall 47 which also extends perpendicularly to the walls 43 and 45. The sidewall 47 and the partition 37 are parallel to each other.

The partition 37 and the walls 43, 45 and 47 form part of the apparatus housing 7. The shortest distance between the pivot 5 and the pivot 27 is smaller than the shortest distance between the pivot 5 and the partition 37. The difference between the two said distances is slightly larger than the wall thickness of the plain bearing 29, viewed in a plane perpendicular to the pivot 27.

The sidewall 47 of the space 39 comprises an electrically positive contact in the form of a metal plate 49, and an electrically negative contact in the form of a conical helical spring 51. The contacts 49 and 51 are electrically connected to an electrical power supply circuit (not shown) of the radio accommodated in the apparatus housing 7. The contacts 49 and 51 (see contact 51) are secured to the sidewall 47 by means of customary, hook-shaped projections (see projection 50) of the sidewall. The pivotable panel 31 is provided with an electrically negative contact in the form of a conical helical spring 53 which comprises an extension 55. The extension 55 serves as an electrically positive contact. The conical helical spring 53 and the extension 55 are secured to the panel 31 again by means of customary, hook-shaped projections of the panel.

The panel 31 is provided with a plate-shaped guide 57, comprising an end edge 59. The plate-shaped guide 57 extends perpendicularly to the panel 31 and is parallel to the flat outer surface of the bottom 21 of the battery holder 1. The dimensions of the battery holder are such that the batteries can be arranged in the relevant troughs with clearance in the longitudinal direction in the battery replacement position of the holder. During insertion of the batteries, therefore they are not clamped between the electrical contacts, so that not even the slightest contact pressure arises between batteries and contacts. In the replacement position of the holder, the panel 31 encloses an acute angle (smaller than  $90^\circ$ ) with the longitudinal wall 23 of the holder, viewed from the inner side of the holder.

When the holder 1 is pivoted in the space 39, the end edge 59 comes into pressure contact with an end edge 61 of the partition 37. The panel 31 is then pivoted towards the batteries, with the result that first the clearance  
5 between the batteries and the relevant contacts is eliminated, after which a gradually increasing contact pressure is built up between batteries and contacts. The contacts then act substantially centrically on the batteries, so that there is substantially no risk of tilting of the batteries. When the holder 1 has been completely pivoted into  
10 the space 39 (operating position), the panel 31 is situated in a plane substantially parallel to the partition 37. In the operating position, the clamping force (contact force) equals the end contact force. By selection of a given  
15 steepness of the end edge 59 with respect to the panel 31, the degree at which the contact force increases during a given angular pivoting of the holder can be chosen as desired, assuming that the initial clearance between the batteries in the replacement position and the conical  
20 helical springs remains the same. The conical helical springs in the form of a truncated cone offer the advantage of a comparatively long spring travel, so that the substantial differences in the dimensions of otherwise similar batteries which occur in practice can be readily compensated for. The length of the helical springs 51 and 53  
25 should be chosen on the one hand so that dimensional tolerances of the batteries can be compensated for, whilst on the other hand it should be chosen so that the springs act substantially centrically on the batteries. An optimum can  
30 be found by choosing a given steepness variation of the end edge 59.

The longitudinal wall 23 of the holder is provided with an extension 63 which closes the space 41 in the operating position of the holder. The extension 63 comprises a closing tag 65 which cooperates with a stop edge  
35 67 provided on a button 69 which is pivotable against spring force and which is secured on the apparatus housing 7. Just before the holder 1 reaches the operating posit-



ion, the longitudinal wall 25 abuts against a helical spring 71 which is secured in the rear wall 40 and which is thus compressed. The spring 71 forces the holder 1 outwards again after the closing tag 65 disengages from the stop edge 67 by operation of the button 69. The spring 71 is required only for pivoting the holder outwards when the holder does not contain batteries. When the holder contains batteries, the helical springs 51 and 53 tend to relax during opening, so that the holder is always pivoted outwards. The space 41 can be used for storing a mains connection cable, with or without a fixed connection in the apparatus housing.

Even though the invention has been described with reference to a preferred embodiment, it is by no means restricted thereto. For example, the pivot of the holder and the panel may also form axes which cross each other at right angles. For this purpose, a battery holder in accordance with said French Patent Specification No. 1,208,847 could be provided with a panel which is pivotable with respect to the holder. It is alternatively possible to provide the holder, at the area of its end which is situated near the pivot 5, with a sidewall which extends perpendicularly to the longitudinal wall 23. On a sidewall of this kind, electrical contacts can be provided to cooperate with fixed contacts in the apparatus housing. The battery holder in accordance with the invention can also be advantageously used for accommodated only one battery. In that case, the contact present on the pivotable panel should cooperate, for example, with a fixed contact arranged in the apparatus housing near the partition 37. It will be obvious that instead of the described conical helical springs, a variety of leaf springs can also be used for the electrical contacts.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A battery holder with a battery which is clamped between a first electrical contact and a second electrical contact in the operating position and which is at least partly enclosed by wall portions of the holder, said holder being pivotable, about a first pivot provided in an apparatus housing, from the operating position to a battery replacement position, the battery being subject to a substantially centrically directed end contact force in the operating position, whilst the battery is not subject to clamping between said electrical contacts in the replacement position, characterized in that the holder is provided with a panel which is pivotable about a second pivot with respect to the holder and on which the first electrical contact is provided, one side of said panel being in pressure contact, during the movement of the holder from the replacement position to the operating position, with a wall portion of the apparatus housing, its other side being in contact, via the moving first electrical contact, with the battery at a contact force which gradually increases until it equals the end contact force due to the pivoting movement of the panel.
2. A holder as claimed in Claim 1, characterized in that the panel is provided with a guide which is in pressure contact with said wall portion of the apparatus housing.
3. A holder as claimed in Claim 1, characterized in that the first and the second pivot are parallel to each other and cross the row of batteries at right angles.
4. A holder as claimed in Claim 3, characterized in that the holder comprises a bottom which extends transversely of the first and the second pivot and which is adjoined by two mutually parallel, longitudinal walls which extend transversely of the bottom, and also a side wall, pivotable about the second pivot, in the form of a panel comprising an electrical contact, the holder being open on the side opposite the bottom as well as on the side oppos-

ite the pivotable sidewall.

5. A holder as claimed in Claim 4, characterized in that on the bottom of the holder there are provided two longitudinal compartments for accommodating two parallel rows of batteries which are electrically connected in series by way of the electrical contact on the pivotable panel.

6. Holder as claimed in Claim 1, characterized in that the first electrical contact on the pivotable panel consists of a helical spring which is shaped as a truncated cone and whose longitudinal axis extends transversely of the plane of the panel.

7. A holder as claimed in Claim 1, characterized in that the second electrical contact is rigidly arranged in a wall of the apparatus housing.

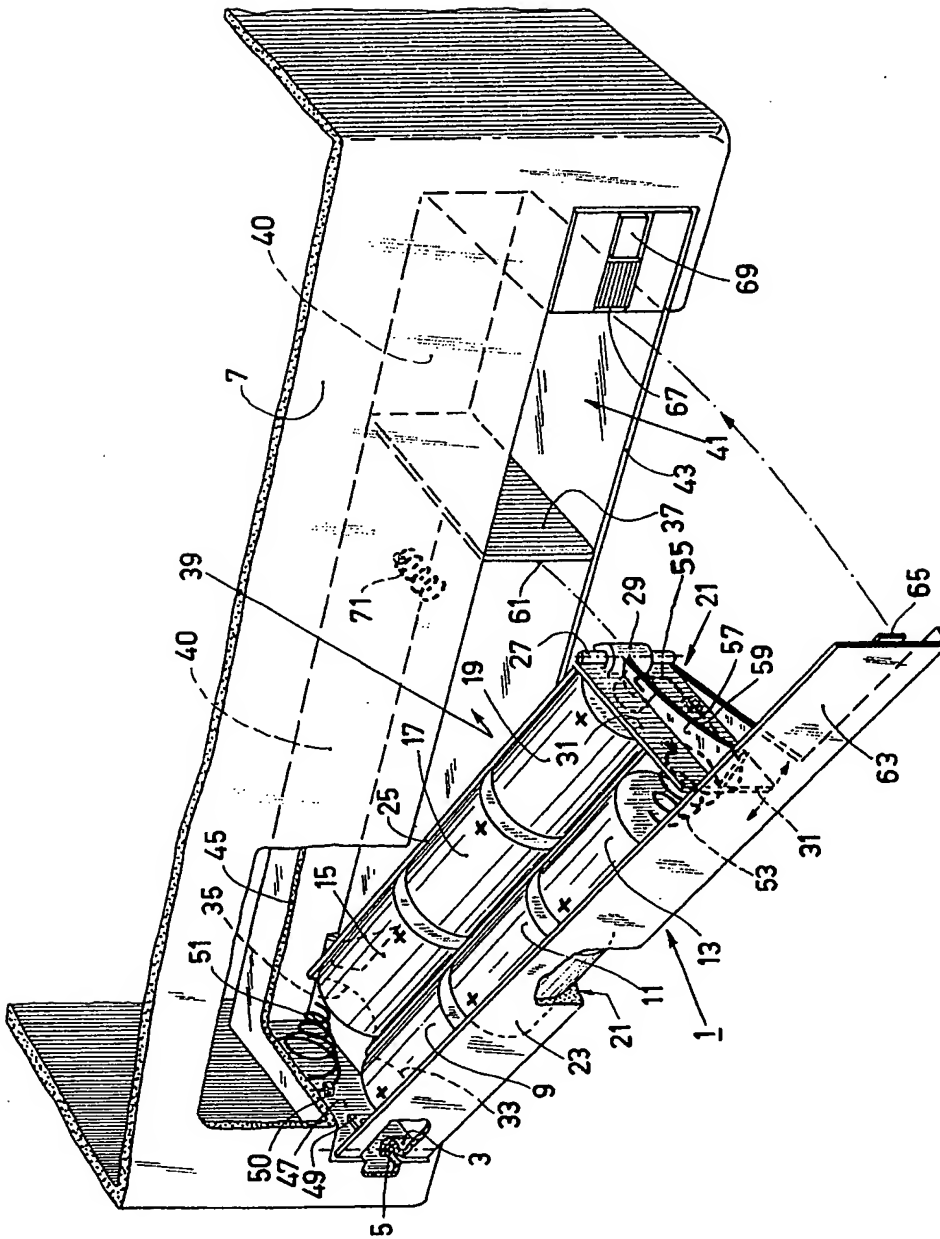


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